Southern California Insect related Tree Mortality

GIS Master Plan
September 2003

Abstract

Consecutive years of below-average precipitation from 1998 to 2003 resulted in large-scale insect outbreaks in the conifer and mixed conifer/hardwood forests of mountainous southern California. From 2001 through 2004, bark beetles of several species attacked drought –weakened trees in epidemic proportions, leading to millions of dead trees and large areas of dead and dying forests. The dead trees have presented numerous challenges to nearby residents and to government administrators at levels from local to national. Such trees greatly increase the risk of catastrophic wildfire, in addition to threats to structures and the electrical grid should they fall. Hazard tree removal and mitigation has thus been a top priority for a number of different agencies.
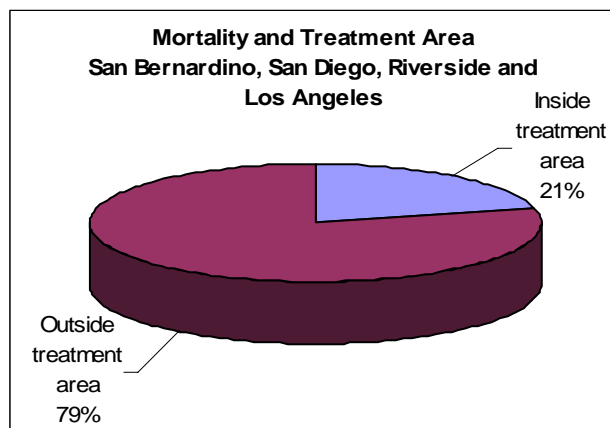
Introduction

Several consecutive years of drought in the mountains of Southern California precipitated a large outbreak of insects that attacked and killed large areas of conifers. The mountains most affected by the phytophagous insects are in San Bernardino, Riverside and San Diego Counties and include the San Bernardino, San Jacinto, Palomar and Cuyamaca/Laguna mountain ranges. While these insects are a natural part of the forest ecosystem, the scale of the infestation and the magnitude of the impacts make this a highly unusual event. In response to the threats posed by the dead trees, Governor Gray Davis signed a Declaration of a State Emergency on March 7, 2003.

Tree Mortality Removals and Hazard Mitigation

The millions of recently dead conifers in the three Southern California counties have created locally increased hazards related to fire and potential tree falls and greatly impacts public safety and forest health. Tracking and mitigating the increased hazards has been a challenge, due to the multi-jurisdictional boundaries, the geographic extent, vegetation management complexities and limited federal and state funding. In response, various government agencies and regional utilities came together to form several ad hoc organizations to be the primary bodies for coordination of local mitigation efforts. They include the Mountain Area Safety Taskforces (MASTs) in San Bernardino and Riverside counties and the Forest Area Safety Taskforce (FAST) in San Diego County. The MASTs/FAST organizations are comprised of the following major governmental agencies and non-governmental groups:

- Federal government agencies such as the US Forest Service and Natural Resource Conservation Service (NRCS)
- State government agencies, such as the California Department of Forestry and Fire Protection (CDF), California Governor's Office of Emergency Services (OES), the California Highway Patrol, and CALTRANS
- Local government organizations, such as county fire, law enforcement, emergency management and transportation departments
- Local Utilities including Southern California Edison (SCE) and San Diego Gas and Electric (SDG&E)
- Volunteer organizations like local Fire Safe Councils
- Private companies providing support services, such as the Environmental Systems Research Institute (ESRI)

Local MAST and FAST groups identified and prioritized, within their respective counties, the need to develop and implement forest stand prescriptions for hazard reduction. Their activities and objectives have included: improving public safety through evacuation planning and fire safe evacuation centers; reducing internal community vegetative fuel risks, especially dead trees; and creating new fuel breaks. Hazard treatments have been targeted to bring affected areas within prescribed lower-risk tree stocking conditions, while coordinating the removal of other vegetation that may interfere with emergency response and evacuation needs. Further efforts of the MASTs and FAST have involved the identification of remaining hazards, public education and outreach, developing wood waste disposal and utilization options and planning for long-term forest sustainability.

Hazardous Tree Removal Efforts

Mortality and Treatment Area
San Bernardino, San Diego, Riverside and Los Angeles

Inside treatment area 21%

Outside treatment area 79%

A primary focus of the MAST and FAST coordination groups is hazard tree removal, which is critical to improve public safety and property. Public safety hazards posed by dead, dying and diseased trees include "falling hazards", when dead trees fall and hit occupied structures or block roads, and increased fuel loading, which can produce extreme fire behavior. Falling trees are a public safety concern because they can block critical evacuation routes, damage occupied structures and destroy emergency communications equipment and other critical infrastructure. Increased fuel loading contributes to extreme fire behavior, including faster rates of spread and increased temperatures, both of which can increase the damage potential and make fires more difficult to control.

GIS Database development to support MASTs and FAST

The complexity of the MAST and FAST organizations necessitated coordination of efforts, given the interactions between all levels of government and the allocation of federal funds. The dispersed, dynamic nature of the problem has made success dependent on accurate, up-to-date, and fully accessible GIS information. Both federal and state agencies have been concerned that available funds are effectively used for hazard mitigation. Geographic Information System (GIS) analysis has come to play an important role in supporting these activities. CDF, as a partner in the MAST and FAST efforts at all levels, recognized this need early on in the process and has developed a GIS database to integrate organization resources in a planned and coordinated manner. Additionally, CDF has been attentive to the potential duplication of effort and conflicting policy issues that need to be quickly identified and resolved. The GIS-produced maps and data have helped to address many of these issues.

The challenges to the creation of GIS database to assist the MASTs' and FAST's coordination of the hazard mitigation have included:
- rapidly changing forest mortality situation in Southern California forests;
- many diverse assets at risk (homes, community centers, power lines, watersheds, water quality, and major roads);
- many different entities with responsibilities and liabilities
- many different GIS data providers and more potential clients and very limited budgets

GIS Master Plan Development

The GIS Master Plan (GMP) developed for the MASTs and FAST uses a decentralized model to deliver necessary components. As such, the GMP is actually a set of similar plans, adapted to the needs of each member organization, which guides the collection of GIS based data and facilitates the production of maps and reports to support dead tree removal. The complete set of GIS Master Plans is presented as a "Tree Cutting Information Flow Diagram" (Figure 1). The basic design recognizes that work gets done by key agency representatives at the local level and information flows out from there.

While each agency developed a unique process, they deviated only slightly from the general pattern represented in Figure 2.

The key steps in the process (from left to right in the figure) include:

1. *Parcel Assessment Plan:* Each agency must first identify where their responsibility area may be impacted by tree mortality and develop a plan to assess specific locations to review on the ground.
2. *Assessment:* Each specific location is reviewed for presence/absence

of mortality. Information on ownership, location, number of dead trees, potential cost of tree removal etc. may be collected.

3. *Schedule:* Once projects are determined, project work is prioritized and scheduled.

4. *Assessment Data:* Once a project location is determined additional data may be gathered. Information may include environmental data, land status information, archeological information or others. At this point the project is considered "planned" and is sent to the MAST database and shared with other agencies and the public.

5. *GIS generated MAP and information for contractor:* Maps, tree counts and other project related information are provided to the group (agency or contractor) tasked with removing dead trees. While a given activity is being conducted, the project is generally considered "in progress" and is sent to the MAST regional GIS database.

6. *Inspection:* Once tree cutting has been completed and an inspection is done, final tree counts, acres, costs or other information is provided and the MAST regional GIS database is updated. The status of the project is then amended to "complete".

7. *Local Database:* With the completion of the project, the local and MAST regional GIS databases are updated. Status maps, tables and charts can be generated and reported to management, elected officials and the public.
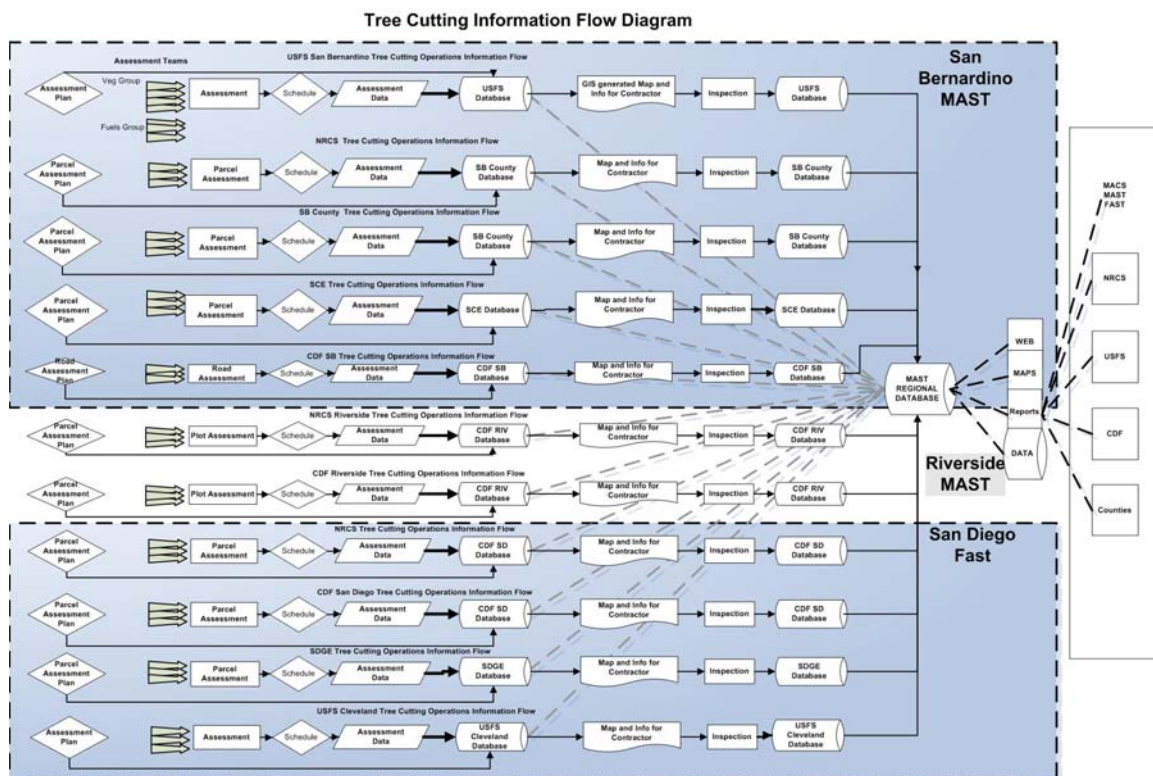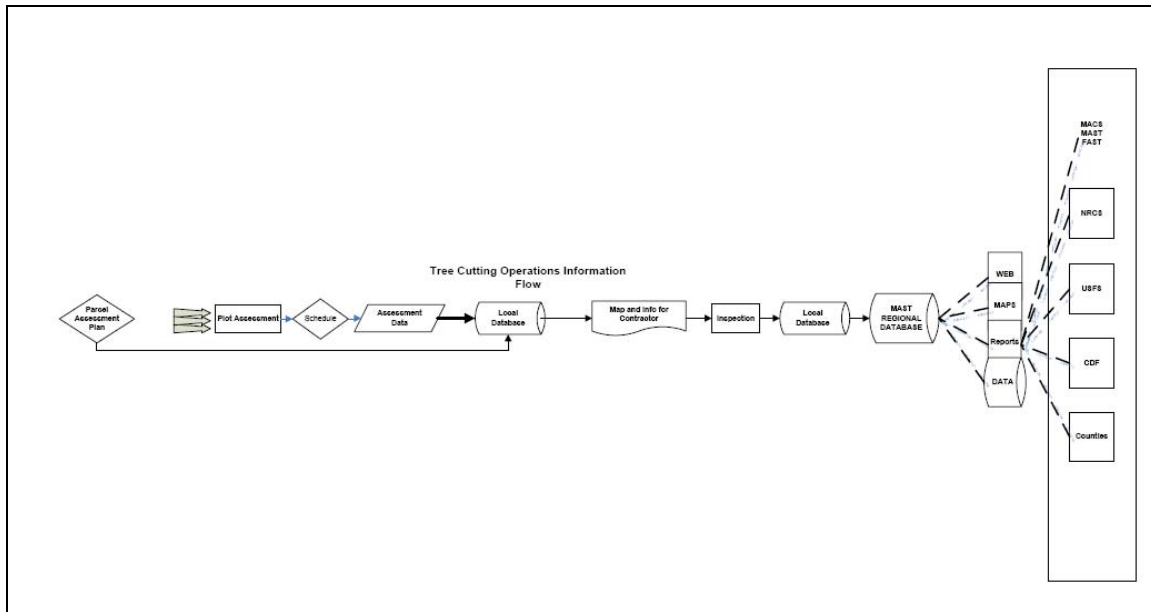
Figure 1

Tree Cutting Information Flow Diagram

Figure 2

Tree Cutting Operations Information Flow

Implementation

Each member agency of the FAST/MAST organizations has ongoing planning and implementation efforts committed to minimizing community fire threat caused by the drought induced tree die back. For example, Southern California Edison, Bear Valley Electric and San Diego Gas & Electric have been removing dead and dying trees from power-line rights-of-way; with the assistance of CDF and others, the California Department of Transportation (Caltrans) has been removing trees along state highways; and San Bernardino, Riverside and San Diego Counties have been organizing tree removal efforts using various funding sources. Each of these organizations has identified their own GIS needs and has arranged for the necessary support. CDF has been compiling GIS based project information from FAST/MAST agencies into a set of GIS data layers in an effort to track the status of treatments being implemented. Thus far, submittal of project boundaries and status information has been done largely on a voluntary basis. Data, maps and reports are currently being made available on the CDF website at http://frap.cdf.ca.gov/projects/mast/

For more information please visit our website or contact Mark Rosenberg at 916-445-5366.